REMARKS

Claims 1-40 are pending in the application.

Claims 1-4, 8-10, 14-21 and 23-40 are rejected. Claims 5-7, 11-13 and 22 are objected to. In the present Amendment, Applicants amend claims 3, 8, 14, 16, 20 – 28, 30, 32 and 34 – 36, and add new claims 41 and 42. No new matter is added.

OBJECTED DRAWING

The drawing is objected to for failing to show a "limit-level surpass detector" as claimed in claim 32. Applicants amend claim 32 to recite "a limit surpass detector", as illustrated for example in Applicants' Fig. 34. The drawing is further objected to for failing to show limit surpass detector 82 in Fig. 30 as suggested as page 71, line 3 of Applicants' specification. Applicants amend the specification to make clear that limit surpass detector 82 is a component of a second embodiment of the invention, illustrated for example by Fig. 34. Accordingly, Applicants respectfully request that the objections to the drawing be withdrawn.

OBJECTED CLAIMS

Claims 3 – 13, 21 – 27, and 29 are objected to in regard to various informalities. Applicants thank the Examiner for suggesting amendments to claims 3, 5, 8, 11, 12, 21 - 26, and 29, and amend claims 3, 5, 8, 11, 12, 21 – 26 accordingly. Applicants respectfully request that the objections to claims 3 – 13, 21 – 27, and 29 therefore be withdrawn.

REJECTIONS UNDER 35 U.S.C. § 112

Claims 20, 23, 24, 26 and 27 are rejected under the first paragraph of 35 U.S.C. § 112 as failing to comply with the written description requirement. The Examiner finds that the claimed "a second frequency multiplexing unit for converting the frequency-shifted signals to analog signals" is not disclosed in the specification. Applicants amend this term in claims 20, 23, 24, 26 and 27 to instead specify "a DA converter for converting the frequency-shifted signals to analog signals", and respectfully request that the rejection be withdrawn.

Claims 3 – 14 and 34 - 36 are rejected under the second paragraph of 35 U.S.C. § 112 as being indefinite. Specifically, with reference to claim 3, the Examiner notes that Applicants' claimed distortion compensation coefficient h_{n+1} (p) is corrected in such a manner that power Pa of the transmit signal will fall below the upper-limit power Pmax, but Applicants also claim that the corrected distortion compensation coefficient h_{n+1} (p)′ is stored in memory when the power Pa of the transmit signal is greater than the upper-limit power Pmax. Applicants amend claim 3 to clarify that the corrected distortion compensation coefficient h_{n+1} (p)′ is stored in the memory when the power Pa of the transmit signal is greater than the upper-limit power Pmax, and a calculated distortion compensation coefficient h_{n+1} (p) is stored in the memory when the power Pa is less than the upper-limit power Pmax.

With reference to claim 8, the Examiner suggests that the current claim language provides for updating the corrected distortion compensation coefficient under conditions for which there would be no corrected distortion compensation coefficient. Applicants amend claim 8 to indicate that wherein when the square of the distortion compensation coefficient is greater than the square of the maximum distortion compensation coefficient, said distortion compensation coefficient updating unit updates the distortion compensation coefficient that has been stored in said memory by the corrected distortion compensation coefficient, and when the

square of the distortion compensation coefficient is less than the square of the maximum distortion compensation, said distortion compensation coefficient updating unit updates the distortion compensation coefficient that has been stored in said memory by the calculated distortion compensation coefficient $h_{n+1}(p)$.

With respect to claims 34 – 36, the Examiner suggests that the claim term "multiplying the transmit signal before the distortion compensation thereof by k" is in conflict with the language of the specification at page 73, line 24 through page 74, line 3 and with Fig. 36. Applicants amend this term to read "multiplying the power of the transmit signal before the distortion compensation thereof by k".

Accordingly, Applicants respectfully request that the rejections as to claims 3 – 13 and 34 - 36 be withdrawn.

REJECTIONS UNDER 35 U.S.C. § 103

Claims 1 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuoka et al. (US 6400774Bl) in view of Mandyam(US 6167273). Applicants respectfully traverse this rejection.

With reference to Fig.8, Matsuoka discloses a distortion compensating apparatus. However, as the Examiner notes, Matsuoka fails to disclose the first and second characteristic components of the claims 1 and 18 that are:

1) a distortion compensation coefficient correction unit for correcting the distortion compensation coefficient, which has been calculated by the distortion compensation coefficient calculation unit, in such a manner that the transmit signal that has been subjected to the distortion compensation processing will not exceed a dynamic range of the DA converter, and

2) a distortion compensation coefficient updating unit for updating a distortion compensation coefficient, which has been stored in the memory, by the distortion compensation coefficient that has been corrected.

Mandyam discloses a transmission circuit in a mobile station which is provided with a DAC(DA converter) 40 disposed on the preceding stage of a Power AMP 46. And Mandyam describes on column 7, lines 4-9 that the DAC 40 is of a limited dynamic range and signals applied to the DAC 40 must be scaled to fit into the dynamic range of the DA.

But, Mandyam fails to teach correction of the distortion compensation coefficient, which has been calculated by the distortion compensation coefficient calculation unit, in such a manner that the transmit signal that has been subjected to the distortion compensation processing will not exceed a dynamic range of the DA converter. That is, Mandyam does not disclose said first and second characteristic components of claims 1 and 18.

Neither Matsuoka nor Mandyam teaches said first and second characteristic components of claims 1 and 18. And according to the claimed invention, the size of a distortion compensation coefficient is corrected in advance, while phase thereof is maintained as is, in such a manner that the input amplitude of a DA converter will not exceed the limit of the DA converter. This makes it possible to follow up phase even if amplitude is limited. As a result, the distortion characteristic will be improved.

Accordingly, Applicants respectfully submit that claims 1 and 18 are allowable.

Claims 3, 8, 14, 16, 21, 25, 28 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuoka et al. (US 640077481) in view of Barber (US 6230031B1). Applicants respectfully traverse this rejection.

With reference to Fig.8, Matsuoka discloses a distortion compensating apparatus. However, Matsuoka does not disclose the first, second and third characteristic components of the claim 3 that are:

1) a comparator for comparing power Pa of a transmit signal output from the predistortion unit and an upper-limit power Pmax,

2) a distortion compensation coefficient correction unit for correcting the calculated distortion compensation coefficient $h_{n+1}(p)$ in such a manner that the power Pa of the transmit signal will fall below the upper-limit power Pmax, and

3) a distortion compensation coefficient updating unit for updating a distortion compensation coefficient by storing a corrected distortion compensation coefficient $h_{n+1}(p)$ in the memory when the power Pa of the transmit signal is greater than the upper-limit power Max and storing the calculated distortion compensation coefficient $h_{n+1}(p)$ in the memory when the power Pa is less than the upper-limit power Pmax.

Barber discloses a power amplifying circuitry for wireless radio transceiver that compares Booster-Power-Out and predetermined sets of limits and determines if the power compensation is required in accordance with the result of the comparison. But, Barber fails to disclose said first, second and third characteristic components in the distortion compensation apparatus of claim 3.

Neither Matsuoka nor Barber teaches said first, second and third characteristic components of claim 3. And according to the claimed invention, the size of a distortion compensation coefficient is corrected, while phase thereof is maintained as is, in such a manner that the power Pa of the transmit signal will fall below the upper-limit power Pmax. This makes

it possible to follow up phase even if power is limited. As a result, the distortion characteristic will improved.

Accordingly, Applicants respectfully submit that claim 3 is allowable.

With reference to Fig.8, Matsuoka discloses a distortion compensating apparatus. However, Matsuoka does not disclose the first, second, third and fourth characteristic components of claims 8 and 21 that are:

1) a maximum distortion compensation coefficient output unit for outputting a value which is the square of a maximum distortion compensation coefficient $h(p)_{MAX}$ obtained based upon an upper-limit power Pmax and a transmit signal x(t);

2) a comparator for comparing the square $| h_{n+1}(p) |^2$ of a distortion compensation coefficient $h_{n+1}(p)$, when the distortion compensation coefficient $h_{n+1}(p)$ has been calculated in the distortion compensation coefficient calculation unit, and the square $| h(p)_{MAX}$ of the maximum distortion compensation coefficient;

3) a distortion compensation coefficient correction unit for correcting a distortion compensation coefficient in such a manner that the square of the distortion compensation coefficient will become smaller than the square of the maximum distortion compensation coefficient; and

4) a distortion compensation coefficient updating unit for updating the distortion compensation coefficient that has been stored in said memory by the corrected distortion compensation coefficient when the square of the distortion compensation coefficient is greater than the square of the maximum distortion compensation coefficient and updating the distortion compensation coefficient that has been stored in said memory by the calculated distortion

compensation coefficient $h_{n+1}(p)$ when the square of the distortion compensation coefficient is less than the square of the maximum distortion compensation coefficient.

Barber discloses a power amplifying circuitry for wireless radio transceiver that compares Booster-Power-Out and predetermined sets of limits and determines if the power compensation is required in accordance with the result of the comparison. But, Barber does not disclose said first, second, third and fourth characteristic components in the distortion compensation apparatus of claims 8 and 21.

Neither Matsuoka nor Barber teaches said first, second, third and fourth characteristic components of claims 8 and 21. And according to the claimed invention of claims 8 and 21, the size of a distortion compensation coefficient is corrected, while phase thereof is maintained as is, in such a manner that that the power Pa of the transmit signal will fall below the upper-limit power Pmax. This makes it possible to follow an up phase even if power is limited. As a result, the distortion characteristic will be improved. Accordingly, Applicants respectfully submit that claims 8 and 21 are allowable.

With respect to claim 14, either Matsuoka nor Barber teaches the characteristic components of claim 14 that are:

1) a table for storing, in advance in association with combinations of $| x(t) |^2$ and $h_{n+1}(p)$, distortion compensation coefficients $h_{n+1}(p)$, obtained by correcting the distortion compensation coefficient $h_{n+1}(p)$ in such a manner that power Pa of a transmit signal, which has been obtained by subjecting a transmit signal x(t) to distortion compensation processing using a distortion compensation coefficient $h_{n+1}(p)$ will become smaller than an upper-limit power Pmax, and for storing as is in advance, in association with combinations of $| x(t) |^2$ and $h_{n+1}(p)$, distortion

compensation coefficients h $h_{n+1}(p)$ when the power Pa of the transmit signal that has been subjected to distortion compensation is less than the upper-limit power Pmax; and

2) a distortion compensation coefficient updating unit which, when a distortion compensation coefficient has been calculated by the distortion compensation coefficient calculation unit, is for obtaining, from said table, a distortion compensation coefficient $h_{n+1}(p)$, that conforms to a combination of the calculated distortion compensation of the transmit compensation coefficient $h_{n+1}(p)$ and the power $| x(t) |^2$ of the transmit signal x(t), and storing this distortion coefficient $h_{n+1}(p)'$ in the memory. Accordingly, Applicants respectfully submit that claim 14 is allowable.

With respect to claim 16, neither Matsuoka nor Barber teaches the characteristic components of claim 16 that are:

1) a table for storing, in advance in association with combinations of $| x(t) |^2$and $h_{n+1}(p)$, distortion compensation coefficients h,(p') obtained by correcting the distortion compensation coefficient h $h_{n+1}(p)$ in such a manner that power Pa of a transmit signal, which has been obtained by subjecting a transmit signal x(t) to distortion compensation processing using a distortion compensation coefficient $h_{n+1}(p)$ will become smaller than an upper-limit power Pmax, and for storing as is in advance, in association with combinations of $| x(t) |^2$ and $h_{n+1}(p)$, distortion compensation coefficients $h_{n+1}(p)$ when the power Pa of the transmit signal that has been subjected to distortion compensation is less than the upper-limit power Pmax; and

2) a means for reading a distortion compensation coefficient $h_{n+1}(p)$ that conforms to power $| x(t) |^2$ of transmit signal x(t) out of a memory, reading a distortion compensation coefficient $h_{n+1}(p)$ that conforms to a combination of $| x(t) |^2$ and $h_{n+1}(p)$ out of said table and

inputting this distortion compensation coefficient to the predistortion unit. Accordingly, Applicants respectfully submit that claim 16 is allowable.

With respect to claim 25, neither Matsuoka nor Barber teaches the characteristic components of claim 25 that are:

1) a table for storing, in association with a distortion compensation coefficient $h_{n+1}(p)$ that has been calculated by the distortion compensation coefficient unit, a distortion compensation coefficient $h_{n+1}(p)$ that has been corrected beforehand in such a manner that the square of the distortion compensation coefficient $h_{n+1}(p)$ will become smaller than the square $l\, h\, (p)_{MAX}\, l^2$ of a set maximum distortion compensation coefficient; and

2) a distortion compensation coefficient updating unit which, when a distortion compensation coefficient has been calculated by the distortion compensation coefficient calculation unit, is for obtaining, from said table, the corrected value $h_{n+1}(p)$ of the distortion compensation coefficient that conforms to the calculated distortion compensation coefficient $h_{n+1}(p)$, and storing this distortion compensation coefficient $h_{n+1}(p)$, in the memory, thereby updating the distortion compensation coefficient.

Accordingly, Applicants respectfully submit that claim 25 is allowable.

With respect to Claim 28, neither Matsuoka nor Barber teaches the characteristic components of claim 28 that are:

1) a table for storing, in association with a distortion compensation coefficient $h_{n+1}(p)$ that has been calculated by said distortion compensation coefficient unit, a distortion compensation coefficient $h_n(p)$ that has been corrected in such a manner that the square of the distortion compensation coefficient $h_n(p)$ will become smaller than the square $|\, h\, (p)_{MAX}\, |^2$ of a set maximum distortion compensation coefficient;

2) means for reading a distortion compensation coefficient $h_n(p)$ that conforms to power of transmit signal $| x(t) |^2$ of a transmit signal x(t) out of a memory, reading the distortion compensation coefficient $h_n(p)$ that conforms to the distortion compensation coefficient $h_n(p)$, out of said table and inputting this distortion compensation coefficient to an error signal generator.

Accordingly, Applicants respectfully submit that claim 28 is allowable.

With respect to claim 31, Matsuoka fails to teach the characteristic component of claim 31 that is an amplitude controller for controlling amplitude of the feedback signal based upon amplitude or power of the transmit signal before the distortion compensation thereof.

The Examiner alleges that Barber teaches an amplitude controller that controls the amplitude of the feedback signal based upon the description on column 10, lines 30-32. But, attenuator 242 in Fig.10 of Barber merely attenuates feedback signal and does not control the amplitude of the feedback signal based upon amplitude or power of the transmit signal before the distortion compensation. Accordingly, Barber does not teach the characteristic component of claim 31.

Accordingly, Applicants respectfully submit that claim 28 is allowable.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuoka et al. (US 6400774Bl) Kawano et al. (US 620149OBl). Applicants respectfully traverse this rejection.

Matsuoka fails to disclose the first and second characteristic components of claim 32 that are:

1) a limit-surpass detector for detecting whether the transmit signal that has been subjected to the distortion compensation processing has surpassed a limit level; and

2) an amplitude controller for controlling the amplitude of the feedback signal when the limit level has been surpassed.

Although Kawano arguably performs a level control based upon the level of the input signal, Kawano none-the-less fails to teach the first and second characteristic components of claim 32.

Accordingly, Applicants respectfully submit that claim 32 is allowable.

As claims 2, 4, 9, 10, 15, 17, 19, 20, 23, 24, 26, 27, 29, 30 and 33 – 40 each depend from one of allowable claims 3, 8, 14, 16, 18, 21, 25, 28, 31 and 32, Applicants respectfully submit that claims 2, 4, 9, 10, 15, 17, 19, 20, 23, 24, 26, 27, 29, 30 and 33 – 40 are allowable for at least this reason

CONCLUSION

In view of the remarks set forth above, this application is in condition for allowance which action is respectfully requested. However, if for any reason the Examiner should consider this application not to be in condition for allowance, the Examiner is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Please charge the amount of $36.00 for two extra claims and $172.00 for two extra independent claims to Deposit Account 50-1290.

Any fee due with this paper may be charged to Deposit Account No. 50-1290.

Respectfully submitted,

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